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is fully twelve miles in width. It seems probable that the latter-mentioned streams formerly flowed through to the master stream of the valley near Stanberry. At Falls City, Neb., on the Big Nemaha, there is a terrace about forty feet above the level of the stream composed mainly of older rocks, capped with a few feet of gravel, which is mostly chert. This material is observed along other streams in Kansas as marking the bottom of preglacial streams. Taking the slope from Falls City to Stanberry, it is found to be about five and one-third feet per mile.

While the facts just considered seem to favor the theory as presented, there are some facts which do not readily harmonize. One is the fact that the pressure in artesian wells at Tarkio cannot be from a higher portion of the main channel, because they are about on the same level with the bottom lands near Nebraska City, so that the water appearing at Tarkio cannot be supplied from the main channel of the Missouri, as we might expect. It seems probable that the water in the Tarkio wells is supplied by an old channel or tributary coming in from the north along the line of the Big Tarkio.

Moreover, the slope of the valley from Nebraska City to Tarkio seems insufficient, but we should remember that we are trying to judge of the slope of the stream from the altitude of the bedrock on the bottom, which may vary from being parallel with the surface of the stream at least thirty or forty feet.

It should be mentioned that at Atchison there is distinct trace of an old channel running toward the northeast and showing several feet of chert gravel about seventy feet higher than the Missouri river. That would indicate that it was probably another tributary of the Platte-Grand river, which is at that altitude because of the divide of the master stream northeast and the Kansas river to the south.

While the tracing of this ancient channel is more of educational than of economic importance, it may eventually lead to the discovery of an important water supply.

The Eleodes of Riley County, Kansas.¹

JAMES W. MCCOLLOCH.

The increasing economic importance of many species of the genus *Eleodes* Eschscholtz has necessitated a careful study of the distribution of the members of this group. The beetles of this genus are native insects confined principally to the semiarid regions of North America. Wickham² has recorded three species—*tricostata*, *opaca* and *suturalis*—from Iowa, and these are the only species reported east of the ninety-eighth meridian. The natural habitat of the various members of the genus is the native prairies or sagebrush areas. The gradual reduction of these areas is depriving these insects of their natural food and forcing them to feed on the more succulent crops. Several species have become adapted to the new conditions and are now recognized as important pests of cultivated crops.

1. Contribution No. 46, from the Entomological Laboratory, Kansas State Agricultural College. This paper embodies some of the results obtained in the prosecution of project No. 100 of the Experiment Station.

2. Wickham, H. F.; 1899. *Eleodes* in Iowa: Proc. Iowa Acad. Sci. 7:59, 60.

In 1915 the department of entomology of the Kansas Agricultural Experiment Station began a thorough study of the species of *Eleodes* occurring in Kansas. In connection with this work limited collections have been made in various localities in the state when opportunity afforded, and extensive collections have been made in Riley county. During the four years that these studies have been in progress four species and one variety of *Eleodes* have been found in Riley county. Certain peculiarities in habitats, relative abundance and activities, bearing on ecological relationships, have been noted, and it seems advisable to publish this short list of species.

Eleodes tricolor Say.

Tricolor is the predominating species in Riley county, constituting over 95 per cent of the total collections of *Eleodes* during the past four years. It is typical of the high prairies of this region, rarely being found in other situations. Of the 1,598 beetles collected last year, 1,587 were taken on the uplands, ten on what might be called second bottom, and one was found running about on a sand beach along the Kansas river.

During the day the beetles are found hiding under rocks, logs and cow chips. As high as thirty-two beetles have been found under a single small rock. In the collections of the past four years the males have predominated, representing 61 per cent of the number collected. The period of activity is from June to October. While the winter is usually passed as a larva, some adults also hibernate, a few having been found early each spring.

Eleodes opaca Say.

Opaca, which is the most injurious species occurring in the state, is only occasionally taken in Riley county. During the years 1916, 1917 and 1918, 303 beetles of this species were collected. All but two of these were collected on the high prairies, where they were usually associated with *tricolor*. In one instance two females were found in an alfalfa field on lowland. The females have predominated in the collections, representing 56 per cent of the total number. The period of activity is from June to September.

Eleodes suturalis Say.

This species is rare in this locality, only a few specimens being taken each year. Nine beetles were collected in 1917 and 1918, six of which were females. In addition, the collection of the Agricultural College contains about fifteen specimens from the area under consideration. With one exception, all the specimens studied were from the high prairies. This species is usually found during the day, hiding under rocks and logs. The period of activity is from June to September. In one case, however, the writer collected a female April 17, 1916, indicating that this species may pass the winter as an adult as well as in the larval stage.

Eleodes hispilabris Say.

Hispilabris is exceptionally rare in this locality, and thus far has been taken only in the sand-dune area along the Kansas river four miles south of Manhattan. The writer collected two males of this species on July 23, 1918, and one female was reared from a larva collected April 9, 1918. One of the males was found under a cow chip and the other was running on the bare sand. The collection of the Agricultural College also contains two specimens taken in the same area. One was found running on the ground, July 26, 1902, and the other was obtained in general collecting, June 24, 1903. From the meager data at hand, the period of activity appears to be June and July. *Hispilabris* has probably been introduced into this area in drift carried by high water on the Kansas river.

Eleodes suturalis var. *texana* Le Conte.

This variety is rare in Riley county, and thus far the writer has not taken it. There are two specimens, however, in the collection of the Agricultural College collected on the hills about Manhattan.